

# Claims

[c1] What is claimed is:

- 1.A method for measuring a battery's condition, comprising the steps of:
  - a) shortening between battery poles by using a designated electric circuit for a short time period, producing high current in said electric circuit, wherein the designated electric circuit is designed to carry high current load;
  - b) measuring process data (voltage and current) during said time period;
  - c) storing measurements of said process data;
  - d) analyzing the condition of said battery based on pre-determined battery parameters and said process data measurements.

[c2] 2.The method of claim 1 wherein the analyzing process includes the steps of checking the correlation between measured current and voltage respective to time and comparing same to predefined current/voltage correlations.

[c3] 3.The method of claim 1, enabling to check condition of the battery testing clamps contacts, further comprising

the steps of evaluating clamps contacts condition by comparing measured process data to predefined values.

- [c4] 4.The method of claim 1 wherein said analysis includes a comparison of said measured data to a predefined battery condition table.
- [c5] 5.The method of claim 1 wherein said short time period ranges between 10 $\mu$ sec and 50 $\mu$ sec.
- [c6] 6.The method of claim 1 wherein the high current produced ranges between 20–60 A for every 1 Ah of battery capacitance.
- [c7] 7.The method of claim 1, further comprising the following steps:
  - entering engine data;
  - calculating starter electrical motor parameters, and correlation factor based on appropriate mathematical model of resistive torque and engine parameters;
  - checking if engine movement during starting process is shorter than a predetermined period of time;
  - displaying a fault starting message if starter engine movement is shorter than a predetermined period of time, otherwise reducing temperature parameter at pre-determined values and checking engine movement again, if starter engine movement is longer than a pre-

determined period of time, until a the engine movement is shorter than a predetermined period of time; and  
–displaying last received temperature as the minimum temperature for engine starting .

- [c8] 8.The method of claim 1, wherein said conditions include CCA, SOC and SOH.
- [c9] 9.The method of claim 6, wherein said starter electrical motor parameters include  $R_A$ ,  $R_S$ ,  $L_A$ ,  $L_S$ .
- [c10] 10.The method of claim 1, wherein said battery includes automotive accumulators, accumulators for UPS systems and solar energy unit.
- [c11] 11.The method of claim 1 wherein said snubber circuit includes a capacitor connected to at least one resistor and at least one diode.
- [c12] 12. The method of claim 1 wherein the snubber circuit includes a capacitor connected in parallel to at least one resistor and serially to one power switch;  
13.The method of claim 12, wherein the snubber circuit is activated before the load decrease.
- [c13] 14.An apparatus for measuring battery condition by shortening between battery poles for a short time period (of 10 $\mu$ sec to 50 $\mu$ sec) producing high current, said ap-

paratus comprised of:

- snubber circuit enabling to prevent results of rapid current decreasing;
- at least two resistors enabling accurate measurement of voltage;
- A/D converter for receiving digital output data of analog measurements;
- microcontroller for analyzing measured data based on predefined battery parameters values;
- display unit for presenting output results of battery condition.

- [c14] 15.The apparatus of claim 1 wherein the snubber circuit includes a capacitor connected to at least one resistor and at least one diode.
- [c15] 16.The apparatus of claim 1 wherein the snubber circuit includes a capacitor connected in parallel to at least one resistor and serially to one power switch.
- [c16] 17.The apparatus of claim 1 wherein the snubber circuit includes a designated inductive components for increased back current and for preventing energy losses during shortening process